

AMS 321: Computer Projects in Applied Mathematics

Project 3

Assignment Date: Wednesday (9/21/2009)

Collection Date: Wednesday (10/28/2009) 5PM

Grade: See Individual Problems

1. (4 Points) In this problem, you do the following mini-projects:

- (1) Generate two square matrices (200×200 in size) A and B with random number elements in interval $[-1, 1]$. For this mini-project, you needn't to store or send in your "A" and "B" matrices.
- (2) Multiply these two matrices to produce matrix C. For this mini-project, you needn't to send the "C" matrix but you need to state clearly how you get the C matrix with your "A" and "B".
- (3) Count approximately how many "add" and "multiply" operations your computer has done for the matrix multiply.
- (4) Now, repeat the about (1)-(3) for matrices of sizes 400×400 . You need to give the operation counts explicitly as you did in (3).
- (5) Now, repeat the about (1)-(3) for matrices of sizes 800×800 . You need to give the operation counts explicitly as you did in (3).
- (6) Derive, based on your results above, a relationship between the "operation count" and the matrix size.
- (7) Draw a line for the relationship you derived from (6) and also plot the dots from the experiments with matrix sizes: 200, 400, and 800.

2. (6 Points) A couple borrowed from a bank \$350,000 at 5.75% annual interest rate. We always assume the bank computes the interest slightly before your payment. To make the problem simpler, we assume

- (a) the first payment is required (and made) IMMEDIATELY after the loan starts
- (b) the daily interest rate is $0.0575/360$ and the interest is always computed daily
- (c) you always assume one month has 30 days
- (d) your report needs only round off to the nearest dollar
- (e) your report about time needs be accurate up to days

Please do the following

- (1) Compute the monthly payment to enable the couple to pay off the loan in 30 years [from the start of the loan date]?
- (2) What if the couple pays \$100 more than the monthly payment [computed in in (1)], compute how many months is needed to pay off loan now
- (3) What if the couple pays \$100 less than the monthly payment [computed in in (1)], compute how many months is needed to pay off loan now.